

The body may become acclimatized to a smaller amount of oxygen, but the acclimatization is generally too slow to be of much help to the aviator. "As we observed it in ourselves during our stay on Pikes' Peak acclimatization consists in three chief alterations: (1) Increased number of red corpuscles in the blood; (2) some change in the lungs or blood (Haldane considers it the secretion of oxygen inward by the pulmonary tissue), which aids the absorption of oxygen, and (3) a lowering of the CO₂ in the lungs is bound up with increased volume of breathing [and decreased alkaline reserve in the blood]."⁴

On Pikes Peak we saw that persons whose breathing under the stimulant of oxygen deficiency increased quickly to the amount normal for the altitude suffered correspondingly little, while those whose respiratory center was relatively insensitive to this influence suffered severely." It seems now firmly established that during any brief period of time, and under conditions to which the individual is accustomed, that the factor controlling the volume of air breathed is the amount of CO₂ produced in the tissues of the body through its influence on the C₂ of the blood. "The oxygen tension of the air is the influence which determines just how sensitive the respiratory center is to excitement by CO₂.⁵ The quickness with which the respiratory center changes with change in oxygen thus becomes an important criterion of fitness in aviator candidates. Fifteen to twenty per cent of all the men who pass an ordinary medical examination are unfit to ascend to the altitudes now required of every military aviator. On the other hand, these tests pick out a small group of 5 to 10 per cent, who, without apparent immediate physical deterioration, withstand oxygen deficiency corresponding to altitudes of 20,000 feet or more." It is particularly interesting to note that when the rebreathing test is pushed beyond the limit that the man can endure, be it the equivalent of only 10,000 or 25,000 feet, two different physiological types with all gradations between them are revealed. The fainting type collapses from circulatory failure and requires an hour or two to recover. Often the heart appears distinctly dilated. The other and better type, on the contrary, goes to the equivalent of a tremendous altitude on the rebreathing apparatus and loses consciousness, becoming glassy-eyed and more or less rigid, but without fainting. When normal air is administered such men quickly recover.—C. F. B.

The heart action of an aviator during flight has been summarized by Dr. G. Ferry (*Sci. Am.*, Apr. 29, 1916, p. 445) as based on a number of flights. His conclusions are: The pulse becomes more and more rapid

from the ground up to a height of 750 meters; from this height up to 1,250 meters it still augments, but less rapidly; and above this height it again accelerates more rapidly. The period of slower acceleration seems to be explained by the fact that between 750 and 1,250 meters the air is usually calmer than at lower altitudes, and the wind more regular. Above this height the cold becomes a greater factor in acceleration. Each time a gust strikes the airplane the pulse accelerates. During a flight at a particular altitude the pulse remains constant. When descent begins there is again for a very short period a quickening of the pulse, due, it is thought, to the thrill of excitement experienced when the engine is shut off. After this the frequency falls in a regular manner during a slow descent. Each event in the descent causes an acceleration, short but definite. The pulse at the end of the flight is always more rapid than at the beginning.—C. F. B.

Henry Woodhouse in "High Altitude Flying in Exploration" (*Geogr. Rev.*, March, 1919, pp. 156-158) calls attention to the following notes from the account of a balloon flight made by Jacques Schneider, Maurice Bienaimé, and Albert Senouique in May, 1913. Dynamometer tests were made at 10,081 meters: For Mr. Senouique on earth it was 105, in the air 110; for Mr. Bienaimé on earth it was 140, in the air 155. At this altitude one's heart is beating about 110 pulsations per minute, producing a blood pressure equal to about 25 centimeters of mercury with the exterior pressure 210 mm. and the interior pressure 250 mm. The strain produced in the tissue of the circulation system is powerful enough to cause death.⁶—C. L. M.

THE COMPOSITION OF THE ATMOSPHERE.

By Dr. K. SCHÜTT.

[Reprinted from the *Aeronautical Journal*, London, November, 1918, p. 382.]

In the course of his paper Dr. K. Schütt refers to an investigation by A. Wigand, who took samples of air at various heights from 1,500 to 9,000 meters and established an increase in the proportion of hydrogen with increase of height and a decrease in the proportion of carbon dioxide. On the basis of this investigation, the following figures are given for the percentage of hydrogen in the atmosphere at 0.20, 50, and 100 km., 0.01, 0.05, 3.72 and 97.84. The subject discussed in greatest detail is the nature of the layer which acts as an electrical conductor and guides "wireless" waves round the globe. A proposal to determine the height of this layer by projecting electric waves obliquely upward and finding where they return to earth is mentioned.—*Bulletin Aero-Club Suisse*, August, 1918.

⁴ A fourth effect mentioned by Dr. A. M. Kellas, *Geogr. Journ.*, January, 1917, in discussing the possibility of climbing Mt. Everest, is the more rapid circulation of the blood stream during exercise.—C. F. B.

⁵ The aeronaut or aviator who may doze at high altitudes may experience the difficulties mentioned by Mrs. F. B. Workman, relative to sleeping at 21,300 feet in the Himalayas (*Independent*, June 6, 1916, pp. 380-382): "As soon as we began to doze and the respiratory movements diminished in force and frequency, the tissues did not get enough oxygen, and we would start up, gasping for breath."—C. F. B.

⁶ A discussion of the cause and best means of fighting "flying sickness" is given by Lieut. Col. Martin Flack in "Flying Sickness," reprinted from *Aeronautics*, in *Sci. Am. Supp.*, Apr. 28, 1912, p. 262.—C. F. B.